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UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item: D.5.4

United Kingdom

# THE IMPROVEMENT OF THE QUALITY OF TROPICAL VEGETABLE OILS

By J.A. CORNELIUS, B.Sc., Ph.D., A.B.I.C.

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

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# The Improvement of the Quality of Tropical Vegetable Oils

By J.A. Cornelius, B.Sc., Ph.D., A.R.I.C.

1. The quality of vegetable oils produced in tropical territories can frequently be improved by better processing techniques, which are often quite simple to apply and may follow from research carried out in the United Kingdom or from experience gained with the same produce in more highly developed producing territories. Such improvements are illustrated in this paper by reference to the production of palm oil, coconut oil and groundnut oil.

## Palm Oil

2. Nearly one-third of the world's palm oil, amounting to about 200,000 tons per annum, is produced in Nigeria where, over the past 12 years, there has been a great increase in the proportion of edible grade oil produced, which contains a low free fatty acid content (less than 5 per cent free fatty acid, calculated as oleic acid, on arrival in the United Kingdom). This grade of oil is used in the manufacture of margarine and cooking fats. In 1950, only 0.2 per cent of the total palm oil exported from Nigeria was of edible grade, whereas in 1961 over 80 per cent of the total exported was of this quality (1). This has been due to improved methods of processing, and in particular, the appreciation by the producers of the need to sterilise the fruit prior to extraction of the oil.

3. For use in the edible oil industry, this oil, which contains some 1,000 parts per million of carotenoid pigments, must be bleached. This is usually carried out either by the use of an adsorbent earth or by heat in the absence of air or by a combination of both methods. However, Nigerian oil is generally considered to be inferior to palm oil from more highly developed territories with regard to ease of bleaching and hence suffers a discount on the United Kingdom market, often amounting to 30 shillings per ton. Since this loss amounts to a considerable sum over a year the Tropical Products Institute in London was asked to investigate the cause of the difficulty (2,3).

4. From the preliminary studies carried out it was concluded that palm oil is more difficult to bleach when it becomes oxidised and further work indicated that oxidation of the oil could occur both before and after extraction from the fruit. It was found that the fruit contains lipoxidases which cause deterioration of the bleachability of the oil when delay occurs in sterilisation of the fruit after harvesting (particularly if the fruit is bruised). After extraction of the oil, deterioration can occur through atmospheric oxidation when the oil is heated in the presence of air if it contains traces of dissolved metals such as iron or copper which act as catalysts.

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(1) Raymond, W.D., Industrial Mechanization in the Underdeveloped Territories, J. Instn agric. Engrs, 16, 70-78 (1960).

(2) Ames, G.R. et al., The Bleachability of Nigerian Palm Oil, J.Sci. Fd Agric. 11, 194-202 (1960).

(3) Raymond, W.D., The Palm Oil Industry, Tropical Science, H.M. Stationery Office, 3, 68-89 (1961).

5. Whereas in the Far East, nearly all the palm oil is produced on a large scale from trees grown in plantations, in Nigeria, the bulk of the oil is peasant produced from semi-wild trees, but it has been shown in the Tropical Products Institute that oil extracted from carefully harvested Nigerian fruit can have a bleachability which is at least as good as, if not superior, to that of commercial oil from Malaya or Indonesia (2).

6. Before extraction, enzyme oxidation can be minimised by (a) taking steps to avoid bruising the fruit during harvesting, (b) sterilizing the fruit with the minimum of delay after harvesting, and (c) sterilizing the fruit on the bunch. After extraction, atmospheric oxidation can be minimised by (a) avoidance of metallic contamination. Metal oxides (particularly of iron and copper), and also the metals themselves to a lesser extent, are dissolved by the free fatty acids present in the oil, but if the suggestions for minimising enzyme oxidation are carried out the oil should also have a low free fatty acid content. Contact with copper (a more effective catalyst than iron) and its alloys should be particularly avoided. A probable source of iron contamination in Nigeria is from the drums in which the oil is transported from the producing areas to the coast, particularly since they are frequently rusty inside. The substitution of road tankers or the use of epoxy-resin lined drums has been suggested, but at least the drums should be clean and free from rust. (b) Avoidance of undue heating of the oil in the presence of air. It is only as the factors causing deterioration are appreciated that such practical steps to overcome them will be undertaken.

7. With regard to processing the fruit and extraction of the oil, interest in many of the oilpalm areas has been shown in a small hydraulic hand press which has recently appeared on the market and is claimed to have an extraction efficiency as high as 95 per cent. The West African Institute for Oil Palm Research at Benin, Nigeria have evolved a small-scale procedure using this press together with simple apparatus for sterilizing the fruit as quartered bunches, pounding the fruit, and clarifying the oil; and this has yielded oil of excellent bleachability (4).

Coconut oil

8. Coconut oil, which is widely used in the manufacture of margarine, compound cooking fat, soap and for other industrial purposes, is extracted from copra, the dried kernel of the coconut. The world production of copra amounts to over 3 million tons, equivalent to over 2 million tons of oil (5). The residual cake or meal are valuable protein concentrates for supplementary animal feeds. The quality of the crude oil depends upon the quality of the copra from which it is derived, which in turn largely depends upon proper and adequate drying when it is being prepared. Moisture is a prime factor in the deterioration of copra quality since if present in amounts greater than about 9 per cent it results in progressive deterioration due to attack by bacteria and yeasts followed by successions of moulds and insects; some of the insects feeding on the moulds. Mites are particularly serious pests since they reduce the copra to dust. Infestation not only causes a loss of weight but also deterioration in value since such copra yields an oil of high free fatty acid content and of a dark colour with corresponding increased refining losses and bleaching costs.

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(4) West African Institute for Oil Palm Research, Advisory Sheets, Nos. 8, 9 and 10.

(5) Commonwealth Economic Committee, Vegetable Oils and Oilseeds, a Review, H.M. Stationery Office, London (1962).

9. Only in comparatively few areas of the tropics can complete reliance be placed upon sun-drying alone. Artificial drying is more generally employed, or a combination of sun-drying and artificial drying. The latter may involve either smoke curing or drying over an open fire, or indirect drying, either on a heated platform or in an enclosed chamber heated by flues. Of the two methods of artificial drying, the indirect driers normally give the best quality product and can, with the exception of a few commercially manufactured continuous driers, be constructed almost entirely locally (6). The Tropical Products Institute has in the past, in response to numerous requests, provided information on such driers to copra producing territories.

10. The ability to grade copra according to its quality, which particularly involves the assessment of moisture content, is highly desirable both for the producer and the trader. For the determination of moisture there are various simple 'field' tests such as inspection for 'water line', the sound made on breaking and the burning test. These rough tests are all empirical. However, moisture content can be determined in the field more accurately by means of a moisture meter such as one relying upon electrical measurement of dielectric constant or resistance. A probe meter based on resistance measurements has been developed by the Pest Infestation Laboratory (7) and calibrated to give direct readings of moisture content. This instrument has been circulated for trial in several coconut growing areas and its applicability for the purpose has shown promise.

There are many advantages to be gained in extracting the oil from the fresh coconut since this avoids the pitfalls inherent in copra production and also the oil so produced is normally of much lower acidity and of better quality than that obtained from copra. Also, both milk and meal are produced as useful by-products. Many methods have been patented for extracting fresh coconuts (8,9) but only two have ever been used commercially as far as is known, and these only in the Philippines. In one of these processes the sliced copra meat is dried before pressing; but in the other process, which is understood to have superseded the first, the sliced coconut meat is pressed before drying, the expressed milk centrifuges to separate the 'cream' which is then cooled to form solid pellets; these are centrifuged again after melting. If an economic process suitable for the underdeveloped territories were to be developed for the extraction of oil from fresh coconuts - one which provided an outlet also for the by-products obtained - it would be of great value to them.

Groundnut oil

12. In Nigeria, up to about seven years ago, groundnuts for crushing were decorticated by the producer almost entirely by pounding the pods in a household mortar. This resulted in only about one-third of the kernels remaining whole.(1) It has been shown that kernel breakage is one of the main factors contributing to increase in acidity on storage (10). The widespread introduction of comparatively simple and

(6) Aten, A. et al., Copra Processing in Rural Industries, F.A.O., Rome (1958).

(7) Tropical Stored Products Information, No.1, 15-16, Pest Infestation Laboratory, Slough, Bucks (1959).

(8) United States Patent, No. 2,742,487.

(9) Nathanael, W.R.N., Chemical and Technological Investigations on Coconut Products, Ceylon Coconut Quarterly, 11, 42 (1960).

(10) Raymond, W.D., The Decortication of Groundnuts, Colon. Pl. Anim. Prod. H.M. Stationery Office, 2, 265 (1951).

cheap hand decortication machines for use by the farmer (Figure I) for which the Tropical Products Institute has been largely responsible, has considerably reduced the breakage during decortication, and today, practically the whole decorticated crop contains at least 70 per cent of whole nuts. The steady decrease in the acidity of the exported nuts since these decorticators were first introduced in the 1954-1955 season is demonstrated by the following figures:

Table 1

| Season | Average free fatty acid content of oil, per cent | Total crop, thousand tons of decorticated nuts |
|---|---|---|
| 1954/55 | 5.07 | 375 |
| 1955/56 | 3.34 | 530 |
| 1956/57 | 2.05 | 357 |
| 1957/58 | 2.94 | 714 |
| 1958/59 | 1.76 | 533 |
| 1959/60 | 1.26 | 445 |
| 1960/61 | 1.46 | 619 |

This improvement in the quality of the exported nuts means an increase in the value of the extracted oil owing to the decreased refining losses involved. For the whole crop this has been estimated to amount to a saving of over £1,000,000 for the 1960/61 season alone.

Figure I Hand Decorticator for Groundnuts

Thus, in the case of palm, coconut and groundnut oils, the application of the findings of simple commodity research has resulted in benefits of considerable financial value due to improvements in quality and in some cases with an increased weight of marketable products.

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**SUMMARY**

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# The Improvement of the Quality of Tropical Vegetable Oils

By J.A. Cornelius, B.Sc., Ph.D., A.R.I.C.

Summary

This paper illustrates by reference to the production of palm, coconut and groundnut oils, improvements in the quality of vegetable oils produced in tropical territories which can follow from the use of better processing techniques.

Although the quality of palm oil exported from Nigeria during the past 12 years has greatly improved with regard to its acidity so that the proportion of edible grade oil (containing less than 5 per cent free fatty acid calculated as palmitic acid on arrival in the United Kingdom) has increased from 0.2 per cent of the total palm oil sold in 1950 to over 80 per cent in 1961, the bleachability of the oil has not improved to the same extent. Hence Nigerian palm oil suffers a discount on the United Kingdom market (often amounting to 30 shillings per ton) in favour of oil from more highly developed territories. Studies in the Tropical Products Institute indicated that palm oil is more difficult to bleach when it becomes oxidised and that oxidation of the oil could occur both in the fruit, before sterilization, through the action of lipoxidases and, after extraction, through atmospheric oxidation catalysed by the presence of dissolved metals. It has been demonstrated that oil extracted from carefully harvested Nigerian fruit can have a bleachability which is at least as good as, if not superior to that of commercial oil from Malaya or Indonesia. The following suggestions are made for ensuring a product of good bleachability.

1. Before extraction:

   (a) Avoid bruising fruit during harvesting.
   (b) Sterilize with minimum delay.
   (c) Sterilize on the bunch.

2. After extraction:

   (a) Avoid metallic contamination, particularly contact with copper and rusty iron.

   (b) Avoid undue heating of the oil in the presence of air.

An extraction procedure under development at the West African Institute for Oil Palm Research, Benin Nigeria, is referred to.

The production of good quality copra, which is necessary in order to produce a good quality of crude coconut oil, depends largely upon proper and adequate drying during its preparation. Moisture is a prime factor in the deterioration of copra since if above about 9 per cent is present, progressive deterioration due to attack by bacteria, yeast, moulds, insects and mites occurs and such impaired copra yields

oil of high free fatty acid content and dark colour. The use of artificial copra driers of the indirect type normally give the best quality product and can be constructed almost entirely locally. There are various field methods for determining the moisture content of the copra and attention is drawn to a moisture meter recently developed by the Pest Infestation Laboratory, Slough, Bucks, which has been tried out and has shown promise in various copra territories. Extraction of oil from the fresh coconuts has been carried out commercially in the Philippines and might be of great value to under-developed territories provided there was an outlet for the by-product.

In Nigeria, up to about seven years ago, nearly all the groundnuts for crushing were decorticated by pounding the pods in a household mortar, which resulted in only about one-third of the kernels remaining whole. Kernel breakage has been shown to be one of the main factors contributing to increase in acidity on storage, and the widespread introduction of hand decortication machines, for which the Tropical Products Institute has been largely responsible, has reduced this so that today, practically the whole decorticated crop contains at least 70 per cent of whole nuts. There has been a steady decrease in the acidity of the exported nuts, from 5.07 per cent in the 1954-55 season, when these decorticators were first introduced down to 1.46 per cent for the 1960-61 season. It has been estimated that this improvement amounts to a saving of over £1.000.000 for the 1960/61 season through the decreased refining losses for the oil.



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SUR L'APPLICATION DE LA SCIENCE ET DE LA TECHNIQUE
DANS L'INTÉRÊT DES RÉGIONS PEU DÉVELOPPÉES

Point de l'ordre du jour : D.4.2

France

# LA COMMERCIALISATION DES PRODUITS ALIMENTAIRES
# EVOLUTION DES STRUCTURES

Par F. PARFAIT,
Directeur Général Adjoint

et J. MILLON,
Directeur de l'Equipement Agricole,
de la Société Centrale pour l'equipement
du Territoire

Les mémoires rédigés à l'intention de la Conférence des Nations Unies sur l'application de la science et de la technique dans l'intérêt des régions peu développées sont des documents de travail. Ils sont publiés tels qu'ils ont été présentés et les assertions et opinions qu'ils contiennent sont celles de leurs auteurs.

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3. Les résumés qui ont été rédigés pour tous les mémoires par les auteurs de ceux-ci pourront être obtenus à la Conférence dans les langues officielles suivantes des Nations Unies: anglais, espagnol, français et russe.

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# LA COMMERCIALISATION DES PRODUITS ALIMENTAIRES

## EVOLUTION DES STRUCTURES

par F. PARFAIT

Directeur Général Adjoint

et J. MILLON

Directeur de l'Equipement Agricole

de la SOCIETE CENTRALE POUR L'EQUIPEMENT DU TERRITOIRE

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Dans tous les pays, développés ou non, la commercialisation des produits alimentaires pose aux autorités gouvernementales des problèmes techniques et économiques délicats à résoudre.

Ainsi, dans le domaine du commerce de gros, on peut constater que les caractéristiques des marchés ne correspondent plus, la plupart du temps, aux exigences des villes modernes; ils sont situés au centre des agglomérations où ils provoquent des difficultés de circulation considérables, ils sont mal reliés à la route, à la voie ferrée ou à la voie d'eau et ne répondent donc pas aux règles les plus élémentaires d'urbanisme, enfin, ils sont mal agencés et trop exigus, ce qui occasionne des frais généraux inutiles considérables et, chose plus grave, facilite grandement les manoeuvres frauduleuses ou spéculatives.

De même, dans les campagnes, les agriculteurs sont très souvent tenus par leurs acheteurs dans l'ignorance des données générales du marché, faute de moyens d'information suffisants et ils ne disposent souvent d'aucun atelier ni de frigorifique où ils pourraient conditionner et stocker leurs marchandises en cas de mauvaises conditions passgères de vente.

Enfin, on peut également observer une inadaptation générale des structures du commerce de détail à un écoulement économique des produits alimentaires : magasins mal situés, trop petits, mal desservis et agencés conduisent à des frais généraux considérables sans aucun bénéfice pour le consommateur ni pour le commerçant.

Ayant pris conscience il y a une dizaine d'années de cette situation, le gouvernement français a entrepris une très vaste action de modernisation de ces diverses structures commerciales, en mettant en place un réseau de marchés de gros et de centres commerciaux ultra-modernes dont la mise en service lui permettra à la fois de résoudre les problèmes d'urbanisme des villes et d'améliorer les conditions économiques de commercialisation des produits alimentaires.

L'expérience ainsi acquise ne peut que s'appliquer de la façon la plus bénéfique aux pays en voie de développement qui connaissent, eux aussi, les mêmes problèmes et qui pourront ainsi trouver plus rapidement les méthodes pour les résoudre.

## 1 - LES MARCHES DE PRODUCTION

### Consistance des marchés

Pour répondre à son rôle, un marché moderne de production doit permettre aux agriculteurs de connaître sans intermédiaire les conditions nationales du marché des produits qu'il vend et d'offrir ceux-ci de la façon la plus favorable.

On y trouve donc d'abord un vaste parking ou carreau, en général à l'air libre, parfois couvert partiellement en vue des mauvaises saisons, qui est le véritable marché où les vendeurs présentent leurs produits et où les acheteurs circulent commodément.

A proximité, les usagers du marché, acheteurs et vendeurs, peuvent disposer de locaux de travail, privatifs ou collectifs, où ils peuvent conditionner la marchandise, c'est-à-dire la trier selon les normes officielles, la présenter, l'emballer et l'expédier directement par fer ou par route.

On trouve également des resserres et des entrepôts frigorifiques où les professionnels peuvent stocker leurs marchandises à court terme ou à long terme dans l'attente de meilleures conditions de vente, installations qui peuvent d'ailleurs également servir aux autorités gouvernementales pour des réserves d'approvisionnement général.

Enfin, les professionnels ont à leur disposition un service d'information public qui leur fournit par télex les cours et les quantités commercialisées dans les principales agglomérations; ils peuvent ainsi avoir une connaissance exacte et immédiate du marché et régler en conséquence leurs apports et leurs offres.

Signalons également qu'il est réservé dans chaque marché la possibilité d'installer une salle de vente aux enchères pour encourager le développement de ce mode de vente qui permet une connaissance officielle des cours beaucoup plus satisfaisante qu'avec les procédés traditionnels.

### Implantation des marchés

Le programme arrêté par les Ministères de l'Agriculture et du Commerce comprend une douzaine de tels marchés dans toute la France implantés dans les régions productrices les plus actives; dans la vallée du Rhône (Châteaurenard et Avignon ) , dans le Languedoc (Nîmes et Montpellier), dans la vallée de la Garonne

(Agen, Montauban, Villeneuve), dans la vallée de la Loire (Angers), etc... Signalons également qu'à Nice est construit selon la même formule un marché aux fleurs qui comptera parmi les plus importants d'Europe.

Ces marchés comportent souvent, en plus de l'installation principale que nous avons décrite ci-dessus, des stations annexes d'expédition et de conditionnement construites sur les lieux mêmes de production et gérées par des groupements de producteurs. Leur action se prolonge d'ailleurs dans le monde agricole beaucoup plus loin que dans le seul domaine de la commercialisation. Sous les directives des services d'Etat et en liaison avec les grandes Compagnies Nationales et les Sociétés d'aménagement rural, leurs organismes de gestion ont un rôle important de contact et de propagande à remplir pour orienter au mieux la production agricole en préconisant des études pédologiques des sols, des essais de cultures nouvelles, des constitutions d'unités rentables d'exploitation, etc...

## II - LES MARCHES DE GROS DE CONSOMMATION

### Consistance des marchés

A côté d'un petit marché de production destiné à l'écoulement des produits maraîchers cultivés dans la banlieue de la ville, on retrouve dans les marchés de gros les ateliers de conditionnement, les entrepôts frigorifiques, les services d'information et une salle de vente aux enchères.

Mais les éléments essentiels sont le parking des détaillants et les magasins des grossistes négociants. Ces magasins sont alignés en rangées où chaque commerçant dispose d'une ou plusieurs cases de 60 à 100 m2 de surface, avec sous-sol, réserve d'emballage, resserre frigorifique, mûrisserie, etc... selon ses besoins L'espace entre les rangées constitue l'allée marchande où circulent les détaillants acheteurs et où se fait ensuite le désapprovisionnement.

Ces bâtiments sont conçus de façon évolutive pour pouvoir s'adapter aux nouvelles formes de commercialisation par circuits directs et service complet, et leur desserte directe par voie ferrée et par route est organisée dans cette perspective.

Ces caractéristiques sont absolument impératives si on désire faire autre chose que construire des magasins modernes, c'est-à-dire si on veut créer un outil dont l'influence sur l'économie nationale soit profonde.

### Implantation des marchés

Le programme arrêté par l'Etat comprend là encore une douzaine de marchés implantés dans les principales villes. Nous citerons en particulier Lyon (ouvert en 1961) , Bordeaux et Toulouse (ouverts en 1962), Strasbourg, Rouen, Grenoble, Rennes (en construction) , Marseille (en projet), etc...

En outre, le marché de Paris est en cours de transfert et l'achèvement des ouvrages est prévu en 1966. Le marché de la viande de La Villette est commencé depuis 1960 et se conjugue avec la reconstruction des abattoirs les plus importants de France. Le marché des fruits et légumes de Rungis a son projet terminé et les travaux ont commencé fin 1962; il est complété par une gare routière de marchandises et par une centrale de collecte des emballages vides qui fonctionne déjà depuis 1960 et constitue certainement l'une des réalisations les plus originales en matière de modernisation des méthodes de manutention d'emballages de produits alimentaires.

## 111 - LES CENTRES COMMERCIAUX DE DETAIL

La modernisation des marchés de gros ne peut produire tous ses efforts que dans la mesure où, simultanément, s'accomplit une réforme profonde du commerce de détail.

L'expérience américaine a en effet montré que c'est l'évolution de ce dernier qui a entraîné celle des marchés de gros et des méthodes de commercialisation des producteurs eux-mêmes; la création de chaînes puissantes de détaillants a en effet conduit les producteurs à s'entendre pour pouvoir opposer une offre organisée et cohérente à une demande concentrée et puissante. Le rôle des marchés de gros est donc devenu plus restreint puisque de nombreuses liaisons directes se sont ainsi nouées entre producteurs et détaillants, mais il n'a pas eu tendance à s'annuler puisqu'on admet que 40 % des produits consommés dans une agglomération continueront toujours à être commercialisés sur son marché. Si ce résultat est atteint aux Etats-Unis, a fortiori le sera-t-il encore dans les autres pays disposant d'un niveau de vie plus faible. C'est donc dire l'importance qu'il faut attacher à l'organisation des marchés de gros et à celle du commerce de détail dont nous allons maintenant décrire comment elle est envisagée en France.

### L'Urbanisme commercial

Le commerce de détail français est essentiellement caractérisé par son extrême dispersion puisqu'on compte un magasin pour 52 habitants, soit 850.000 au total dont 680.000 commerçants indépendants. Nombreux sont parmi eux ceux qui n'ont aucune rentabilité et qui grèvent donc l'ensemble de la profession de frais généraux considérables.

L'objectif recherché consiste donc à en réduire leur nombre dans une double perspective :

- obtenir des marges de commercialisation plus faibles car amorties sur un trafic supérieur,
- ne pas établir de monopole au profit d'une forme donnée de commercialisation et favoriser au contraire une saine émulation entre les divers processus.

Pour des raisons faciles à comprendre, il est extrêmement difficile de l'atteindre en agissant sur les structures commerciales en place. Par contre, l'action des pouvoirs publics peut être beaucoup plus efficace sur la conception de l'équipement commercial dans les quartiers d'extension des villes, et tel est l'objet de " l'urbanisme commercial " . L'effort de construction portant actuellement en France sur 350.000 logements par an, on pense pouvoir en profiter pour moderniser à raison de 1 à 2 % par an notre commerce de détail et atteindre ainsi le but recherché en une dizaine d'années grâce à l'émulation que cette action ne manquera pas d'entraîner.

Il est extrêmement difficile d'exposer en ces quelques pages les principes d'intervention de cette nouvelle technique qu'est l'urbanisme commercial. Sur le plan économique, son fondement consiste à comparer le pouvoir d'achat de la population susceptible de fréquenter le centre, ventilé par catégories de commerce, avec le seuil de rentabilité de chacune de ces catégories. Cette comparaison brute est ensuite corrigée par certains coefficients d'attraction ou d'évasion et fournit en fin de compte la composition optimale à donner au centre commercial.

Sur le plan technique, les études portent essentiellement sur l'emplacement à donner à ce centre compte tenu des courants de trafic prévisibles dans la ville et sur sa conception qui doit être aussi attractive que possible tant sur le quartier immédiat que sur les proches environs.

D'une façon générale, on arrive à la conclusion que l'importance d'un tel centre doit être comprise entre 1,5 et 2 m2 par logement desservi, la surface totale se répartissant environ par moitié entre commerces courants et commerces occasionnels et également environ par moitié entre surfaces de vente et réserves.

Plus d'une centaine de tels centres sont d'ores et déjà construits, à la grande satisfaction des habitants, et l'étude de leur fonctionnement est plein d'enseignements pour la poursuite de la réforme.

## IV - PROBLEMES ADMINISTRATIFS ET FINANCIERS

Pour terminer, nous donnerons quelques renseignements sur les moyens administratifs et financiers qui ont été mis en oeuvre pour parvenir à ces divers résultats, car ils présentent des caractéristiques très nouvelles susceptibles d'application dans de nombreux autres pays.

### Les moyens juridiques et administratifs

Ils ont été déterminés essentiellement par le fait que les actions à entreprendre étaient situées à la charnière des domaines traditionnellement réservés à l'initiative privée et à l'autorité publique et qu'il était donc indispensable de réunir en un même organisme leurs divers responsables si on voulait unir de façon vraiment efficace les intérêts publics et privés.

Le gouvernement a donc préconisé la constitution de sociétés d'économie mixte où les intérêts publics sont majoritaires et qui reçoivent des

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collectivités publiques la concession de réalisation et de gestion des ouvrages. Ces sociétés groupent d'une part les collectivités publiques, villes et départements, d'autre part les organismes représentatifs des intérêts professionnels, c'est-à-dire les chambres de commerce et d'agriculture, les principales organisations syndicales et les organismes de construction de logements. Il s'y ajoute enfin les établissements financiers qui sont, la plupart du temps, les Caisses de Crédit Agricole, les Caisses d'Epargne, et surtout la Caisse des Dépôts et Consignations.

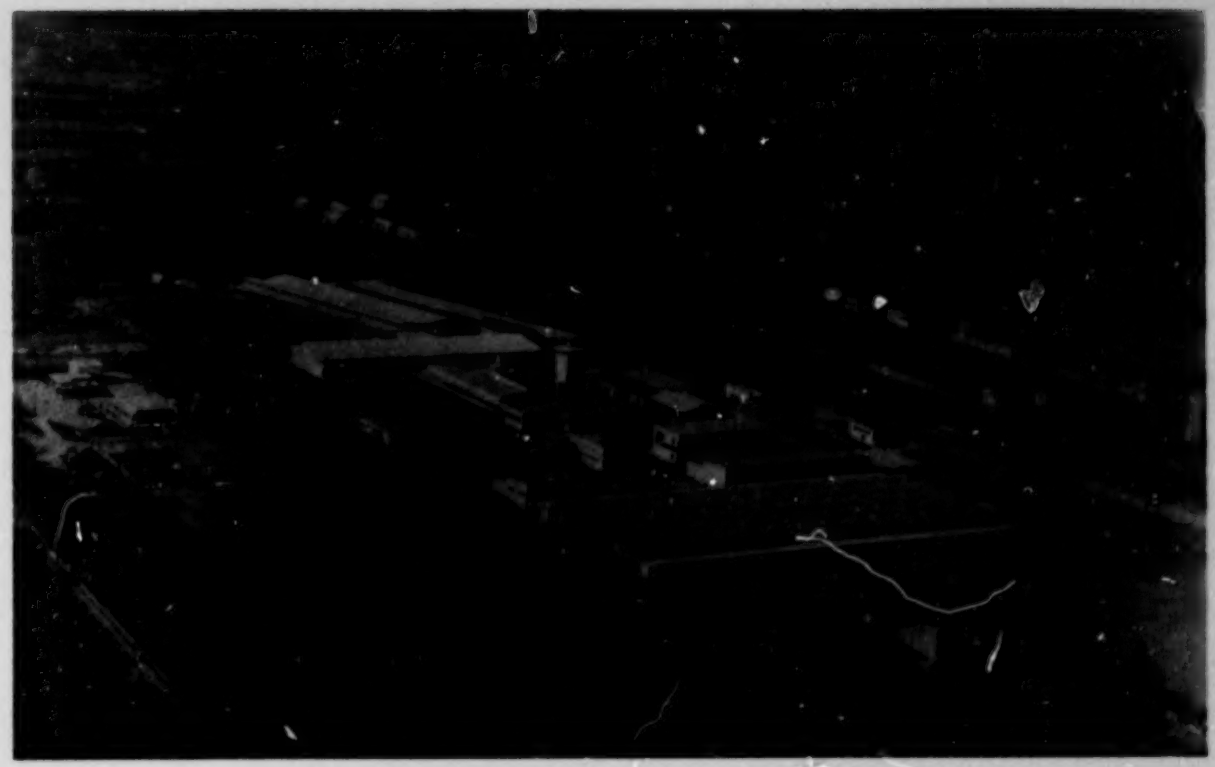
Enfin, la plupart des Sociétés, au nombre d'une vingtaine pour les marchés d'intérêt national et de soixante pour les sociétés d'aménagement urbain, ont confié leur administration à la Société Centrale pour l'Equipement du Territoire (S.C.E.T.), filiale de la Caisse des Dépôts et Consignations et des autres organismes publics de crédit agricole, industriel et foncier. Du fait de l'étendue de son action, la S.C.E.T. peut mettre ainsi à leur disposition un pool de plusieurs centaines de techniciens de toutes spécialités qui leur permet d'exercer leur action avec le minimum de frais généraux. L'expérience acquise par la S.C.E.T. a d'ailleurs été mise également à profit par un grand nombre de pays étrangers qui lui ont confié de nombreuses missions de coopération technique.

Les moyens financiers

Le caractère mixte des ouvrages à réaliser trouve également son expression dans la réunion des moyens de financement nécessaires à leur réalisation.

En ce qui concerne les marchés de gros, la Municipalité prend en général à sa charge, en contrepartie des avantages d'urbanisme, les dépenses d'acquisition et de mise en état des terrains, soit 20 à 30 % du total des investissements. Le surplus des dépenses est supporté par l'organisme gestionnaire du marché qui le finance à l'aide de prêts à caractéristiques spéciales accordées par l'Etat ( pour moitié, à 3 % et 30 ans ) et par la Caisse des Dépôts et Consignations ( pour moitié, à 5,25 % et 20 ans ) , qui marquent ainsi l'intérêt national des ouvrages. Enfin, les annuités de gestion sont remboursées par les commerçants en fonction de leur activité, dans la double limite d'un investissement commercial inférieur à 100 NF la tonne et d'une charge annuelle au kg de produit commercialisé inférieure à 0,01 NF.

En ce qui concerne les centres commerciaux, le financement de la construction peut être assuré soit entièrement par des prêts privés, soit par des prêts des Caisses d'Epargne aux organismes publics de construction d'H.L.M., soit encore par des avances à 6 ans de l'Etat ou de la Caisse des Dépôts et Consignations aux sociétés d'économie mixte d'aménagement urbain. Dans ce dernier cas, les magasins sont achetés par les commerçants qui réunissent les fonds nécessaires moitié par autofinancement et moitié par des prêts de la Caisse Centrale de Crédit Hôtelier Commercial et Industriel ( 6 %, 15 ans ) .



Marché d'Intérêt National de NIMES

Marché d'Intérêt National de LYON

Centre Commercial de Mont-Saint-Aignan
Seine Maritime

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UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

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**SUMMARY**

Agenda Item : D.4.2

France

# MARKETING OF FOODSTUFFS : STRUCTURAL DEVELOPMENT

By F. PARFAIT,
Assistant General Manager,

and J. MILLON,
Agricultural Equipment Manager
of the Société Centrale
pour l'Equipement du Territoire

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

## NOTES

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# MARKETING OF FOODSTUFFS: STRUCTURAL DEVELOPMENT

By
F. PARFAIT, ASSISTANT GENERAL MANAGER AND J. MILLON,
AGRICULTURAL EQUIPMENT MANAGER OF THE SOCIETE CENTRALE
POUR L'EQUIPMENT DU TERRITOIRE

In most countries whose economy is based on trading, the structures for marketing foodstuffs are unsuited to the requirements of modern life, from the point of view of town planning and hygiene as well as the simplification of distribution systems by the elimination of more or less speculative middlemen. Thus in the country producers are often unaware of the general state of the market and frequently have no packaging or refrigerating plant available. In the field of wholesale trade, market buildings have become obsolete; situated in town centres, they have poor road and rail links; built 50 or 100 years ago, they are too small and cause considerable traffic congestion; badly designed, they are ill-suited to the clear fixing of market prices and involve all users in considerable unnecessary overheads. Finally the same general unsuitability is found in the retail trade, where shops are, more often than not, too small and badly designed.

Faced with this situation, France has, for the past ten years or so, been carrying out a vast improvement programme on these buildings.

In the producing areas, a system of packaging and despatch centres has been set up, grouped around market depots termed "of national interest", where marketing and price-fixing are centralised. These markets consist basically of a huge floor-space where goods are displayed, packaging and refrigerated storage stations which are available to farmers and traders, a public information service linked by telex to the European system and, finally, an auction room to encourage the use of this sales method.

A dozen markets of this kind have so far been built in the most important areas: Rhône Valley (Châteaurenard and Avignon), Languedoc (Nîmes and Montpellier), Garonne Valley (Agen and Montauban), Loire Valley (Angers), etc.

In big urban centres, traditional municipal markets are replaced by a national system of wholesale markets designed on extremely modern lines. They have direct links with road and rail services and their expansion potential is enormous. Here, traders have practical premises, with basements, packing stores, refrigerated storerooms, ripening rooms, etc. The buildings are so designed as to allow development to adapt them to new direct, full service marketing methods.

Markets of this kind are already operating in Lyons (opened in 1961), Bordeaux and Toulouse (opened in 1962) and are being built in a dozen more cities such as Strasbourg, Rouen, Grenoble, Rennes, etc.

Moreover the Paris Market is being transferred and work is expected to be complete in 1966. The La Villette Meat Market was begun in 1960 and is going ahead in conjunction with the rebuilding of biggest abattoirs in France. Plans for the Rungis Fruit and Vegetable Market are complete and work began at the end of 1962; it is supplemented by a lorry depot and a collecting centre for empty crates which has been operating since 1960 and which is certainly one of the most original concepts in the modernisation of food packaging handling.

Finally, in the retail trade, the Ministries of Building and Trade have encouraged, in new residential areas, the creation of modern trading centres where new forms of integrated trading, with supermarkets, can develop alongside improved traditional methods. The layout of these centres is decided after careful economic calculations aimed at obtaining low trading margins by concentrating business in a small number of shops and not setting up a monopoly in favour of any one trader or any given trading system. Their siting also obeys certain rules constituting what is now called "commercial town planning". In this way, it is intended to initiate a new trading structure, at the rate of 1 to 2% per annum, and offer an example to independent traders that will prompt them to carry out voluntary general trading reforms, to be largely completed within 10 to 15 years.

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It is not yet possible to state the effect of this overall activity on the economy, but it can already be said that the legal, administrative and financial services which have been set up seem perfectly satisfactory and have proved extremely efficient.

On the administrative level the fulfilment of these projects has been entrusted to companies in which public bodies (town councils, chambers of commerce, chambers of agriculture, etc.) have majority holdings. Most of these are associated with public banking institutions (Deposit and Consignment Offices, Agricultural Banks, Land Banks, etc.) and their common subsidiary, the Société Centrale pour l'Equipement du Territoire, which has set up a pool of services and highly experienced technicians which it puts at their disposal for general administrative purposes.

In the financial sphere the State grants long-term loans at reduced rates of interest for the building of the "national interest" markets, investments in which are shared among the towns (for the town planning advantages they offer) and trade users. As to the trading centres, funds are lent to the companies which build them by the State or the Deposit and Consignment Office, backed up by traders who, for this purpose, can take advantage of 15-year loans from the Central Hotel Credit Bank.



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# TECHNICAL AND ECONOMIC FACTORS IN THE CHOICE OF STEEL PLANT LOCATION

by

R. B. Elver[1], T. H. Janes[2] and J. H. Walsh[3]
Department of Mines and Technical Surveys
Ottawa, Canada

1) A competitive primary iron and steel industry in any country is a national asset that can provide the basis for the establishment of a broader secondary manufacturing industry and stimulus for growth in many sectors of the country's economy. In less-developed countries and areas of any industrialized country where there is no primary iron and steel industry, or where the existing industry is too limited in scope to be a motivating force for economic growth, there may exist sufficiently favourable conditions to warrant considering its establishment or expansion.

2) In this paper an attempt is made to outline general and specific considerations that should be borne in mind when an appraisal is made of the feasibility of establishing, expanding or diversifying a primary iron and steel facility. While admitting that government should play an important supporting role, the technical and economic factors reviewed here are those which a company engaged in commercially profitable enterprises would employ in its analyses. Factors that have affected the establishment and development of the Canadian iron and steel industry are reviewed.

## General Discussion

3) The prime motivating force in establishing a steel industry may be economic, social or political. In most countries, all three factors are important to some degree and affect the final decision. No matter what the motivating force may be and what the political-industrial relations within an area or country may be, the prime objective in establishing a steel industry should be to provide primary and secondary products at lower prices than those currently available. On this basis alone it would be difficult to justify some plants being considered or already in existence throughout the world. Moderately higher price levels are tolerable, however, when the establishment of a steel industry is considered within a broader plant of economic development by which, in

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1) Mineral Economist, Mineral Resources Division.
2) Senior Mineral Economist, Mineral Resources Division.
3) Senior Metallurgist, Fuels and Mining Practice Division, Mines Branch.

time, a sufficiently large integrated industry can evolve that would achieve economies because of scale of operations. Under such conditions government policy could promote establishment of a steel plant by such techniques as selective tariffs or by the more positive techniques of tax incentives and bounties.

4) Before proceeding with plans to initiate a steel industry or expansion of an existing one, considerable study should be given to determine the size, nature and location of present and possible steel consumption within a given area in relation to the size and nature of the steel plant to be erected and the raw materials to be assembled. In most instances it will be found that no market is sufficiently large to justify a policy of self-sufficiency in the production of every shape, size and grade of steel products consumed or required. A small plant making a limited range of products may be all that is originally justified. Thus, a continual appraisal of the steel-product market in conjunction with a policy of encouraging development of steel-consuming industries is desirable. A flexible tariff schedule and tax incentive program are necessary to obtain the earliest possible end-results. A tariff increase may be necessary to promote new industry. On the other hand, and equally important, a decrease in tariffs should be considered when the industry matures in order to make steel products available at the lowest possible price. It should still be sufficient to enable repayment of capital costs and investment in new plant and equipment.

5) The attitude and ability of both management and labor are of major importance when anticipating a successful industry. In all instances, it will be preferable to initially employ top management and experienced operators from established steel areas. It will be necessary to train and educate both indigenous management and labor not only technically but generally in order to build a populace that is better able to cope with industrialization problems.

6) When considering steel plant location, it is the authors' belief that one must take a broad approach to the problem by determining the size, nature and location of the present and future market for primary steel shapes and for secondary products made primarily of steel. Such an approach is realistic in that emphasis is placed on markets rather than upon resources or other factors. Although resources are important, a domestic self-sufficiency in raw materials used in a primary steel industry is not necessarily a prerequisite to starting a primary iron and steel industry.

7) Although costs of labor, raw materials at the source, power, land and other items are important, the cost differentials of these facotrs in assessing steel plant location within a large region are small compared to differentials in transport costs of raw materials and finished steel products. During the eighteenth and most of the nineteenth centuries, the number of tons of coal required per ton of iron and steel produced compared with ore requirements and steel-product shipments to market overwhelmingly favored steel plant locations near coal-producing regions. The locational dominance of coal has dwindled when considering locations for new steel plants because of major advances in technology generally and particularly in fuel economy. By the end of the nineteenth century, the locational pull of ore had, in a few instances, become significant in relation to the tons of coal required. To-day, the amount of ore required generally exceeds that of coal by a significant margin. Another important reason for the decline of coal's dominance in steel plant location is the ready availability of scrap in many parts of the world. By the end of the nineteenth century, scrap consumption had become of major importance in reducing the requirements of iron ore and, consequently, coal per ton of steel produced. Because of the lower amounts of ore and coal required

and the increasing amounts of scrap used per ton of steel produced, the attraction of a market-oriented location has increased. Trends to beneficiated and higher grade natural ores resulting in lower transport costs and additional fuel economies; the availability of scrap; coal savings through the use of supplementary fuels; and a large differential between transport costs of raw materials and steel products together have all resulted in a relative increase in the significance of markets rather than raw materials as the dominant locational factor for steel plants.

8) During the last decade, another set of conditions has resulted in the emergence of coastal locations for steel plants, particularly in more industrialized countries where domestic supplies of ore are low grade and coal costs are relatively high. In such circumstances coastal works can take advantage of the abundant supply of high-grade ores now available from many world sources and the availability of high-quality coking coals, mostly from North America, to replace or supplement domestic coal supplies.

9) In the future, as the need for greater amounts of iron in the form of ore or scrap increases and the availability of economic domestic energy and reductant resources decrease, it is conceivable that a gradual trend may be established wherein industrial nations may import iron and energy together in the form of such products as pig iron, sponge iron and even crude steel. This trend would work to the advantage of less-developed nations. Many such nations, with growing steel requirements but lacking one or more of the basic raw materials for steel manufacture, have access to world supplies as readily as have industrialized nations. In addition, technical changes in making pig iron and steel have progressed to where alternatives to the blast furnace pig iron process might be considered. Such alternatives can be based on domestic sources of natural gas, fuel oil or electricity rather than on coke made from imported coal. Because of present and anticipated greater economies in large, integrated blast furnace-steel furnace facilities, application of new reduction processes will probably be limited to small market areas relatively distant from integrated steelworks, or for special applications.

10) Because of the large capital investment required for new steel facilities it might be prudent to compare the benefits resulting from alternative capital investment. Economic theories suggest several methods by which the effect of the establishment of a steel industry on an area can be estimated. It has been established that the multiplier effect in related secondary and service industries and the economy at large is greater from the establishment of a steel plant than from the establishment of most other primary industries. Simple "comparative-cost" studies, unfortunately do not provide a comprehensive picture of the total effect on an economy from investment in any particular industry, especially its effect on secondary employment.

11) Ideally, an 'input-output' analysis could be used to determine the impact of a new industry on a region's economy. However, the detailed information required to make such an analysis is rarely available. Theoretical and practical difficulties arise from the use of coefficients obtained from a study of an economic situation existing before the erection of a steel plant if they are used to estimate conditions that would prevail afterwards.

12) A more feasible and practical method would appear to be the 'industrial-complex' approach. In this analysis, an assumption is made of other principal industries that would likely be formed or expanded as the result of establishing a primary iron and steel plant. The decision to invest in primary steelmaking facilities would then depend on

whether the benefit resulting from the complex is greater than it would be for investment in other industries.

Markets

13) In the development of a general program, the authors contend that prime consideration on building a steel plant should be placed on a detailed analysis of steel-product consumption after a preliminary analysis indicates that economic iron and steel production is within the range of economic feasibility. Investment funds necessary for an iron and steel industry are large and even though an iron and steel industry is usually the basis for general industrial growth a comprehensive statistical and market analysis is vital to the economic feasibility appraisal. The consumption pattern of iron and steel products within the country or geographical region under consideration should be determined in detail. In some instances it may prove desirable for two or more countries to cooperate in a market study with a view to establishing a joint steel complex to serve an enlarged market area. The statistical information on steel-product consumption should be gathered and tabulated by region, industry, shape, size and kind. Present sources of primary steel shapes should be noted. In cooperation with consumers, it may be possible to reduce in number the different shapes and sizes that are required. This could be of benefit by lowering capital outlay for equipment, depreciation and capital writeoffs and general operating costs.

14) During the planning of an industrial-growth program, consideration should also be given to the expansion and diversification of secondary manufacturing industries. The type and quantity of steel required for such planned growth should be estimated and incorporated into the projected market pattern. The evolved pattern should also have regard to population growth, possible population shifts and anticipated per capital income as these factors usually reflect changes in total steel required, product mix, general purchasing power and transportation costs of steel products to the market. In a more general context, present and potential levels of gross national product, national income, balance of payments position and similar factors should be considered to establish the best methods of financing, the rate at which investment capital can be repaid and the amount of capital that can be realistically invested in a new steel plant, or in the expansion of an existing one.

Rolling Mills

15) Based on present and projected steel consumption, by kind, the extent of established and possible markets can be resolved into categories that reflect the range of products that can be produced on various types and sizes of rolling mills. It will become evident that some categories of steel products will not be sufficiently important to warrant installation of a mill to produce those products. Any mill should operate regularly and process enough crude steel to warrant the capital expenditure; idle equipment and invested capital raises production costs of all items. Thus, imports of certain steel shapes such as larger structurals, wide sheet, coated sheet and heavier plate will probably be necessary until such time as the domestic market is sufficiently large to justify additional mill installations for their production. Also, it may be some time before the market for specialty steels (stainless, high alloy, tool steel, etc.) is important enough to warrant consideration. Later in a location study, one must return to the market pattern to determine if some shapes are available elsewhere at a significantly lower price to warrant continuing imports even if a minimum-size total market is available to support a domestic

mill. From such data, one or more mills can be selected to give the maximum benefit in terms of return on capital, more stable employment and lower-cost steel products to the domestic consumer. Advantages should be taken of improvements in steel rolling mill practice and technology. Continuous casting has been sufficiently developed to warrant consideration of its use. This technique can bypass the steel ingot, soaking pit and blooming mill stages and achieve considerable savings in capital investment and operating costs. Combination rolling mills such as bar and strip, rail and beam, bloom and plate, etc. may also be installed to advantage to achieve cost economies.

Steel Technology

16) Once the nature and extent of the steel product market to be supplied has been determined and decisions made on the number, type, size and complexity of the steel rolling mills that might economically be installed, consideration should then be given to the kind of ironmaking and steelmaking facilities that will supply crude steel to the rolling mills. In most instances, iron and steel facilities will be built adjacent to the rolling mill section of a plant to achieve maximum economies on items such as transportation, handling, energy management and quality control. In some instances, it may prove desirable to establish a non-integrated mill closer to a specific market area that is distant from an integrated complex centrally located to serve a widespread and large market. Facilities that might be built to make crude steel can vary considerably A small, electric steel furnace plant that is based entirely on scrap as a raw material would probably be sufficient to supply limited quantities of steel for products such as reinforcing bars and other merchant mill products. It is difficult to make steel of sufficient quality to produce acceptable flat rolled products by melting scrap in electric furnaces. It may prove desirable to establish rolling facilities and import such primary steel shapes as ingots, blooms billets and slabs rather than determinedly build complete facilities. For large-scale production, the blast furnace for ironmaking and the open hearth or basic oxygen process for steelmaking will usually be the most economically feasible processes to employ. On an intermediate scale of output, electric furnace ironmaking may find a place if hydroelectric power is available at low cost. Processes to produce a sponge iron or reduced iron for steel furnace charging may prove more economical and practical than blast furnace or electric furnace pig iron, especially if low-cost fuel oil, natural gas or non-coking coal are readily available.

Raw Materials

17) Simultaneously, the analyst should consider the source of iron ore and other basic raw materials, the quality and supply of scrap, and energy sources that might be available before the best location for iron- and steel-making facilities can be properly assessed. The domestic raw material resources of an area or country should be reviewed For present producing areas, the quality of the products shipped and their costs would be known. Resources not yet being mined should be evaluated not only in terms of total cost of production but also with respect to quality, variations in quality, available reserves and, if necessary, beneficiation characteristics. Consideration should be given to the adequacy of installed transportation facilities. For the movement of most bulk commodities such as iron ore, coal and limestone, rail and/or water facilities would be reviewed to determine the less costly. In some instances, particularly for steel products, road transport may be the least expensive means. Transport costs are of prime importance in considering steel plant location. A detailed assessment of costs for moving materials to and from the steelworks is necessary to determine the most 'economic' plant location.

Analysis

18) With required data on resources, transport and markets, the analyst working in conjunction with a team of specialists (ore dressers, metallurgists, design engineers, etc.) would select several alternative locations on which total cost of steel ingot production costs could be determined. One or more locations would likely be considered for each of the following general areas - coast, inland near market, and inland near major resource(s). For coastal works or those on inland navigable waterways, major factors to consider are: proximity to market, adequacy of transport to inland market and suitability of harbor for boat movements, docking, etc. It is important to note that all or a portion of raw materials might be imported to advantage by lowering costs of production. Exports could then be in the form of raw materials if excess production to needs is developed, pig iron, crude steel, rolling mill products and, conceivably, secondary manufactures. An inland works near the major market area should be on present or projected transport facilities. A weighted minimum transport cost for all steel shipments can be estimated if transport costs and the amounts of steel that will go to all markets are evaluated.

19) For each hypothetical location, the quality and cost of raw materials can be assessed to determine the most economic processing equipment that might be installed to supply steel ingots for the proposed steel rolling operation. The most suitable raw material mix from domestic and foreign sources would also be determined. When the costs of rolling the various steel products at each hypothetical plant location have been estimated, comparative cost studies of weighted transport costs for steel products to the market can be made. From these, the most economical location for a steel plant can be selected. Other less important factors that, in particular instances, may be critical are water supply, labor supply, labor cost differentials, local taxes and by-laws. Having agreed upon the most desirable steel plant location the estimated cost of steel products in the main markets, a comparison of present prices paid for these products from other sources, domestic or foreign, will determine which products can be supplied more economically to the ores from a new or expanded plant and the severity of competition that will be encountered.

20) If tax incentives, national policy, subsidy and related factors are not considered, steel plant location is then very closely related to the nature of the market that can be served and the anticipated competition in that market. The market governs the amount, size, and type of steel products that can be produced competitively and this, in turn, influences the size and type of iron and steel-making facilities that might be built. The kind of iron and steel to be employed is also dependent upon the cost and quality of the raw materials available.

21) If, as a matter of national policy, it is considered desirable to have an iron and steel industry, the analysis at this point would afford a means of determining the cost to the country of establishing a protected industry. Excess cost, in the form of high prices for domestically-produced products, may rule out further consideration of a domestic industry under existing circumstances.

## Development of the Canadian Steel Industry

22) Since its origin in the latter part of the nineteenth century, the Canadian iron and steel industry has been confronted with many problems of development. The industry's success, particularly during the last two decades, has been responsible in considerable part for Canada's status as an industrial nation and for the relatively high standard of living prevalent in Canada. When considering the industry it should be regarded as several separate companies competitively pursuing a common profit motive rather than as a single body centrally regulated with respect to markets, prices, investment, etc. This is not to say, however, that the companies constituting the Canadian iron and steel industry disregard their social and national economic obligations. Government help and influence in the form of subsidies, taxes, tariffs, legislation and moral suasion, have aided in its establishment and growth.

23) As in many countries up to the 1880's, there were several small iron forges in Canada. Between 1850 and 1880, several non-integrated rolling mills were constructed whose operations were based originally on scrap and iron, and later in part by imported crude steel. In 1879, as part of the federal government's National Policy, a decision was made to encourage domestic iron and steel production through the establishment of duties on imports of steel items made in Canada. In addition, a bounty system was in effect between 1883 and 1910 on the production of pig iron and steel. On the municipal level, tax incentives were offered to new industry. This action gave impetus to various commercial interests as well as to domestic and foreign entrepreneurs to consider the feasibility of establishing primary iron- and steel-making facilities to supply a portion of the steel market. As a result, between 1895 and 1905, blast furnaces were erected at three of the four locations where integrated steel works presently exist.

24) The Nova Scotia plant was located on tidewater near a coal source. Ore and limestone were imported from captive mines on tidewater in Newfoundland, then not part of Canada. The Nova Scotia plant was well located with respect to ocean and inland water routes and to eastern Canadian rail facilities. At Hamilton, Ontario, a plant was established to utilize domestic ores but it soon proved more attractive to import ore from the United States via inland waterways. Coal was imported from the United States for all Ontario blast furnaces, even though domestic sources existed in eastern Canada. The Hamilton plant was strategically located with respect to markets and rail and inland water transport. The third plant built during this period was well located with respect to a captive ore supply and nearby sources in the United States. Coal from the United States required a long rail and water haul. This plant was further from the main concentrated market in southern Ontario but was in a better position to supply the railway system and expanding agricultural areas in the west. The fourth integrated plant became established, as such, in 1951 at Hamilton. It was based on imported coal and ore and serves the most concentrated market area in Canada. It grew out of a foundry operation established in 1913 and which, through a series of company purchases and amalgamations, had become a substantial producer of electric furnace steel, based on purchased pig iron and scrap, and rolling mill products. Besides the four integrated works, two of the integrated companies also operate steel rolling mills closer to specific markets. It should also be mentioned that during the industry's formative years, several other companies made attempts to establish iron and steel plants but, for various technical and economic reasons, they failed. Financing of the industry during the early years was largely through bonds sold in England although some capital was obtained in the United States. There was no dearth of technical and commercial ability in Canada but it was felt expedient to bring some

highly qualified personnel to Canada to manage, advise and work in some of the plants. This practise exists even today, particularly with respect to highly-trained management and technical persons.

25) From 1900 to 1920, the industry prospered by producing wire for fences and nails, merchant mill products and products for the railway industry. World War I provided the impetus to increase production and diversify the product mix.

26) Between 1920 and 1939, the industry was static in terms of increased production, diversification, significant new facilities, markets and financial stability. By the beginning of World War II, however, the industry was sufficiently sound to enable considerable expansion in production facilities and product mix. Since World War II, the industry, in concert with an unprecedented growth in the Canadian secondary manufacturing industry, expanded production facilities and diversified to the extent where Canada is self-sufficient in nearly all steel products. This is due, primarily, to growth in population and national income sufficiently large to justify investing in necessary plant and equipment. All steel companies have not expanded or modernized equally because of variations in such factors as proximity to the area in which market growth has been most significant, availability of capital, changed raw material costs, management, etc.

27) In recent years, considerable interest has been shown concerning the feasibility of new integrated facilities in western Canada and Quebec. Consideration has been given not only to traditional processes but also to other ore reduction processes in various stages of technical development based on electricity, fuel oil, natural gas or non-coking coal. In western Canada, extensive reserves of oil and natural gas were discovered in the 1950's that not only provide a relatively inexpensive energy source but also an expanded oil and gas industry market for steel products. Coking coals have also been defined there and limestone is in good supply. Well-located iron ores of suitable quality are not readily available but low energy costs could offset this disadvantage. The main problem, however, is defining sufficient markets to justify establishment of an integrated industry. In Quebec, a location along the upper St. Lawrence River is well suited to the assembly of raw materials. The main problem here is also to define the market closely and to determine what portion would be satisfied from a local plant in competition with existing integrated plants in Ontario and Nova Scotia and from electric-furnace plants in Quebec's main market area. Consideration is also warranted on the various alternate processes to the blast furnace for iron production if the market is not large enough to justify building a traditional blast-furnace plant. In fact, the electric furnace 'direct-reduction' process is now used to produce pig iron of different grades in Quebec and British Columbia. In the former, iron is a coproduct with titanium-dioxide slag and in the latter it is made from iron oxide calcine that is a byproduct of non-ferrous mining and concentration operations. At present, several provincial governments in concert with industry are evaluating various other possibilities.

28) It is difficult to determine what part protection by tariffs and aid by bounties have played in the establishment and development of the Canadian steel industry. The decision to encourage a domestic steel industry was part of the 'National Policy of 1879' when the iron and steel industry received important new protection with duties on rolled and forged steel items that ranged up to 20 per cent. Steel ingots were admitted free until they could be made in volume in Canada and in 1883 they were subject to a specific duty. In that year a federal bounty was established on pig iron produced from domestic ore; this was extended in 1894 to Canadian-produced steel and in 1897 to pig iron made

from foreign ore. Federal bounties with various changes continued in effect until December 31, 1910, when all bounty payments were withdrawn. Moderate tariff protection is still accorded the Canadian iron and steel industry. Items not made in Canada enter duty-free or at very low rates; items made in Canada are dutiable to an extent that depends upon domestic production capacity, markets and other considerations. The domestic industry owed its establishment, in large part, to federal and provincial bounties on pig iron and steel; the existence of tariffs on imported steel products, and the granting of certain municipal incentives. The only remaining bounty is that paid by British Columbia for a limited amount of pig iron production. Notwithstanding the aid provided the early industry by bounties and tariffs, all the present pig iron and steel plants in Canada have been built and have grown because of fundamental economic and technical conditions rather than because of a national policy of protection to the industry. Its production capacity today of about 8 million tons of ingots a year, placing it 12th among world producers, is based primarily on the industry's ability to compete with other highly industrialized nations both with respect to quality and cost of steel rolling mill products. It is of interest to note that the Canadian industry depends in large measure on imported raw materials.

29) In conclusion, the Canadian iron and steel industry has grown and diversified at a very satisfactory rate in spite of the country's location adjacent to the very large, highly-industrialized economy of the United States to the south. This growth, based to a large degree on imported raw materials, has been achieved on the basis of private enterprise initiative with the government role being of a secondary or supporting nature except in the area of tariffs. The main stimulant to location and growth has been markets rather than resources, even though Canada is rich in the raw materials for steelmaking. The presence of water, rail and land transport facilities for the assemblage of raw materials and distribution of steel products is of the utmost importance.

## Selected References


1. U.N., "World Iron Ore Resources and Their Utilization," New York, 1950, 74p.

2. - , "Study of the Iron and Steel Industry in Latin America", Vol. I and II, New York, 1954, 121p.

3. - , "Survey of World Iron Ore Resources", New York, 1955, 345p.

4. - , "Problems of the Steel Making and Transforming Industries in Latin America," New York, 1958, 62p.

5. - , "Long-Term Trends and Problems of the European Steel Industry," Geneva, 1959, 176p.

6. Isard, W., "Some Locational Factors in the Iron and Steel Industry Since the Early Nineteenth Century", Journal of Political Economy, June 1948, pp. 203 to 217.

7. Isard, W., and Capron, W.M., "The Future Locational Pattern of Iron and Steel Production in the United States," Journal of Political Economy, Chicago, April, 1949, pp. 118 to 133.

8. Isard, W. and Cumberland, J. H., "New England as a Possible Location for an Integrated Iron and Steel Works", Economic Geography, Worcester, Mass., Vol. XXVI, 1950, pp. 245 to 259.

9. Isard, W. et al, "Methods of Regional Analysis", The Technology Press and John Wiley & Sons, Inc., New York, 1960, 784p.

10. Pinot, M.J., "Location of Steel Industries", Iron and Coal, London, Feb. 27, 1959 pp. 499 to 502 and March 6, 1959, pp. 553 to 556.



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UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

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**SUMMARY**

Agenda Item: D. 7. 1

Canada

# TECHNICAL AND ECONOMIC FACTORS IN THE CHOICE OF STEEL PLANT LOCATION

By R. B. ELVER,
T. H. JANES
and J. H. WALSH
Department of Mines
and Technical Surveys,
Ottawa, Canada

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

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# TECHNICAL AND ECONOMIC FACTORS IN THE CHOICE OF STEEL PLANT LOCATION

by

R. B. Elver[1], T. H. Janes[2] and J. H. Walsh[3]
Department of Mines and Technical Surveys
Ottawa, Canada

## SUMMARY

1) An economically sound primary steel industry is well recognized as a desirable entity when considering the economic growth potential of a particular region or country. In this paper, attention is given to general and specific considerations required in determining the merits for possible steel plant locations. Factors affecting the location and development of the Canadian industry are reviewed.

2) When an evaluation of steel plant location within an area is made, consideration should be given to raw materials, iron- and steel-producing processes, steel rolling mill facilities and markets. Of importance, also, is the mode and cost of transporting raw materials and finished steel products. An efficient handling and transportation system, besides its importance to other sectors of a country's economy, could be the difference between economic success or failure because transportation is one of the largest cost items in the price of both raw materials and finished steel products.

3) Rather than select a particular resource and estimate the costs of processing and transporting steel products, a locational study for a steel plant should be market-oriented. Ore and energy resources are readily available in the world market and advances in iron and steel technology might warrant consideration of processes not entirely dependent on coking coal. The market should be defined in terms of size, nature and type of steel products consumed. An analysis should be made of future population, migration flows, purchasing power and purchasing habits Anticipated growth or establishment of new secondary manufacturing industries will, of course, affect the market pattern. Once the market pattern of present and future steel consumption has been evaluated, it will be possible to estimate the size and types of rolling mill equipment that might be installed. Following this, the size and nature of the iron and crude steel producing facilities can be tentatively agreed upon.

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(1) Mineral Economist, Mineral Resources Division.
(2) Senior Mineral Economist, Mineral Resources Division.
(3) Senior Metallurgist, Fuels and Mining Practice Division, Mines Branch.

4) At this point, a preliminary review will suggest several possible steel plant locations. In the selection of possible locations for detailed study, the following situations would probably be included: - tidewater, inland water, market and major resource. For each location considered, calculations should be made of total steel ingot costs for various sizes and types of plants using various raw material and process combinations. Steel rolling mill costs for each main type of product being considered would also be estimated.

5) As a separate but integral part of a location study, a weighted transportation cost of moving all steel products to the anticipated market areas from each possible plant location should be made. By combining and comparing the various cost data, an evaluation of various hypothetical locations will indicate which one can best serve the anticipated market area. The raw material requirements, either imported or domestic, and the size and type of processing equipment best suited to the situation would be indicated.

6) The Canadian iron and steel industry has grown and diversified satisfactorily in close proximity to a very large, production- and cost-conscious steel industry in the United States. This growth, based to a large degree on imported raw materials, has been achieved with relatively minor government influence or help except in the area of tariffs, which are not high. The main stimulant to its establishment and growth has been markets rather than resources. The presence of water, rail and land transport facilities for the assemblage of raw materials and distribution of steel products is of very great importance. A favorable investment climate is essential to progress in any country's industrial growth. This factor coupled with a desire to increase one's standard of living and improve an area's economic position and well-being is probably the most important means towards industrial growth, particularly in a basic industry such as the manufacture of iron and steel and their products.



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Agenda Item : D.4.3

India

# PROBLEMS OF BULK STORAGE AND THE PROSPECTS OF NEW TECHNIQUES IN THIS FIELD: MINISTRY OF FOOD AND AGRICULTURE

By S.V. PINGALE,
and N.S. AGRAWAL

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Agenda Item: D-4: Problem of Bulk Storage and the prospects of new techniques in this field (Ministry of Food and Agriculture).

by
S.V. Pingale[1], and N.S. Agrawal[2]

Bulk storage of agricultural produce particularly the foodgrains has been a common practice in India due to seasonal nature of production, uncertain harvests and a year round demand for cereals which constitute the bulk of the food. Visitations of famines, locusts, droughts and floods had also to be combated with by maintaining sufficient stocks on hand. A number of techniques and methods of storage got developed in the past for maintaining over a time bulk stocks of foodgrains and similar agricultural commodities. Some of them continue to remain in vogue and are known as 'conventional' methods. Any discussion on the prospects of the new techniques will have to take into account the background of conventional techniques.

Conventional methods of bulk storage prevalent in India:

(a) Underground storage has been one of the most common techniques followed for the storage of a number of commodities like foodgrains, some of the spices and even oilseeds. This technique comprises an excavation in the ground and keeping the produce covered with earth in its most elementary form. In the modern shape a structure built in masonry and covered with concrete so as to make it fairly airtight is being used. In between these, structures built with unbaked or baked bricks, plastered with mud or lined with water-proof materials are also in use. This storage is invariably considered to keep the commodity free of pest attacks and thefts. In practice thefts are guarded against but not the pest attacks, probably as the stores are not sufficiently airtight. Under this system once the storage is sealed with a commodity filled in, it could be opened only during the fair weather and, once opened, has to be emptied without any loss of time. This limits the utility of this type of storage for maintaining bulks.

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1, 2 - Department of Food, Government of India, New Delhi.

(b) Where underground structures were not possible on account of water seepage, above-ground structures comprising of simple construction made out in either mud, straw or wood and lately in brick and concrete got developed. Commodities are either stored in sacks or loose. These structures do not offer protection from pests and moisture but have become popular on account of low cost and the ease with which stocks can be moved in and out.

The various types of indigenous storage structures known by different names in different parts of the country may be classified as shown at Table I.

The structures described above served the purpose in the past when agricultural commodities were available in large quantities and some spoilage was taken for granted. With the industrial development, transport facilities, increase in per capita income and quality consciousness, losses have assumed significance. Further, with the introduction of money economy and provisions to protect the producers vis-a-vis the consumers, the stabilisation of prices of the agricultural products has become an important objective of the storage programmes. For holding large reserves to achieve stable conditions, the conventional methods being adopted impose limitations, the most important being maintenance of quality.

No systematic data regarding losses to grain stored conventionally are available, but on account of the very favourable conditions for deterioration in India, these are considered to be high. With the efforts to step up production, mouths to be fed are also ever increasing, which necessitates making every effort to conserve whatever is produced. In the previous two 'Five-Year Development Plans' of the country, stress had been laid on increase of the production of all the important agricultural commodities. Foodgrains (cereals and pulses) production in India was of the order of about 76 million tons during 1960-61. By 1965-66 it is estimated that 100 million tons of foodgrains need be produced (rice - 45 million tons, wheat - 15 million tons, other cereals 23 million tons and pulses 17 million tons). In the situation it has become necessary both from the point of view of conserving whatever is produced and from the point of stabilisation of the prices, to maintain bulks of foodgrains. A beginning has also been made by proposing to hold a bulk of 5 million tons of foodgrains and a target of about 3 million tons has already been reached. At present mainly imported grains are used for maintaining the bulk but the indigenous grains will be used as soon as production reaches the target level by 1965-66.

The bulk of foodgrains now being maintained as a price lever and known as 'buffer stock' is distributed all over the country in a number of centres. In selecting a centre, a number of aspects have been considered - such as the demand in the area over a number of years, period for which foodgrains could be held safely and the likely turnover in relation to demand, effect on the market in case large quantities are to be off-loaded from storage on account of deterioration, facilities of transport and for handling and the source of supply.

Types of resources:

In general the cereal crops are harvested by hand in India. It

has certain advantages such as the crops get thoroughly dried to a safe limit of moisture content of 8 to 10%, qualities remain separate and individual attention is paid to various blocks in which a particular variety of crop is grown. Since the process is very slow, many a risk are also attendant on this. Very often the cereals get damaged in the threshing floors due to rains, hail storms and fire. Over and above this, cereals get insect infestation (Sitophilus oryzae L, Rhizopertha dominica F, and Sitotroga cerealella O) in the field.

Indian climate is very conducive for the development and multiplication of microflora. Their activities are further enhanced by the presence of insects in the cereals. Throughout the year the insects and the microflora if attack is initiated in the field would flourish in the grain causing a substantial damage. Regarding the storage fungi, there is evidence that so long as the seeds remain attached to the rachis and surrounded by glumes, they are much less susceptible to invasion by storage fungi than the kernels that are threshed out. Complex of conditions influences the invasion of stored grain by insects and fungi and in practice these operate together. The major ones are moisture content, temperature, amount of previous infestation, time and the activities of various grain inhabiting insects and mites.

Storage and handling in jute bags of all the farm commodities is the standard method now in vogue in the country. For the sake of facility of handling and cheapness, the use of bags in almost all stages like transport storage, long distance movement and marketing etc. is being practised. But it presents no barrier to the entry of insects, rodents, moisture, contaminants etc. Keeping in view the facility for fumigation, stacks measuring 30 x 20', 18 to 20 bag high consisting of 1500 to 1600 bags each containing 93 kgs. of wheat are kept in Government controlled warehouses. The cost involved for control operations and handling comes to be relatively high as compared to handling same quantity of grain in a loose condition. Moreover, bagged storage poses a problem for checking the quality of grain and for scientific inspection while loose storage is advantageous for these reasons, the most convincing being the ease in handling and inspection. Two silos have been erected in the country recently which highlight the difference between bulk and bag handling. Plans to get more bulk stores particularly of the 'flat type' constructed in the country, machinery for weighing, drying etc. are afoot. These constructions are further being undertaken at central places with a view to hold large bulks at strategic points. Considerable progress has been made in this direction already and experience bears out the anticipations of the scheme. Besides foodgrains, bulk storage of fruits and vegetables, specially potatoes and peas, is being successfully planned and carried out in the country.

Although bulk-storage of perishables, such as fruits and vegetables, will be associated with the problem of heat generation, tissue injury and microbial spoilage, the technique of field-spraying with hormone and surface coatings with fungicidal composition and wax emulsion have been tried and found to give an extended storage life to these commodities. In conjunction with the temperature and humidity control of the warehouse, the above pre-treatments are seen to offer better scope for reducing spoilage during their transit and storage.

Fruits, vegetables and other perishable commodities contain high moisture and are metabolically very active. The bio-chemical activities in tissues remain at a high level during the post-harvest storage, these offer special problems relating to the high catabolic activities and tissue deterioration due to autolysis and activities of pathogenic and saprophytic microflora. Adequate ventilation, temperature and humidity controls of the environment and restriction of the depth of the bulk became essential for extending storage life. Fungicidal treatment for the control of fungi, wax-coating for preventing transpiration, hormone treatment for modifying the metabolic pathways, have been tried and found helpful for enhancing the shelf life of the fruits and vegetables. Every fruit and vegetable is observed to require different optimum conditions and treatments for the maximum storage life and these have been worked out. Several aspects of the storage and post-storage behaviour of refrigerated, cold and cool storages have been investigated with most of the major fruits and vegetables in India. Besides safe and sound conservation of farm produce, its transport from production centres to consumption centres plays an important role in the food economy of the country and this is also receiving attention.

Transport problems:

Due to dearth of power and limited capacity of the farmers to go for power transport, the primitive method of carrying the farm produce over short distances in head-loads continues. For bringing the produce to the market centres, bullock-carts, donkeys, camels, manual labour etc. are being used in different regions of the country depending on terrain and distance. Road and rail transport is limited and herein mainly bagged cargo is transported from one place to another. Efforts are being made for loose transport of an imported commodity like grain but on a large scale it has not been possible so far. Commodities move from production centres to consumption centres and sometimes there is nothing to be loaded from consumption centres to other places and empty haulage poses a problem. Possibility of making multi-purpose wagons is under the active consideration. Presently there are no special rail wagons for transport of the agricultural commodities and these have to be carried in sacks in all-purpose wagons.

In commercial stores bagged grain keeps well for about 6 months at the port towns, while in the interior centres it keeps for about 12 months. When the facilities for loose grain storage are provided, the storability of grain is expected to be further increased. Only rice might offer some difficulties for loose storage but according to recent works this also seems possible.

Marketing facilities:

Out of a few thousand markets in the country, only 521 are regulated and of these about 300 are regulated for foodgrains. Buyers fix the price on sample basis and keeping in mind the likes and dislikes of the populace of the area. In the absence of a national grading system, it becomes very difficult to get a product of a uniform quality which is so necessary for bulk storage. Presently the Government have drawn up national grades for various foodgrains and this should facilitate grade-wise selling and make bulk storage easier.

Mechanical handling:

This has been provided in a few centres and experience relating to it is satisfactory. Mechanisation, however, is loudly resented by the labour and the general conversion has to be gradual and such as not to affect a large scale unemployment. The large bulks are appropriate for mechanisation and this is planned in the future construction programmes.

Underground storage supposed to be airtight has been followed in the country from time immemorial. It has recently been suggested that the use of airtight structures would overcome most of the difficulties of storage. This suggestion has much to recommend in it. But the airtight bins do not permit storage of damp material, for recent work has shown that the condition known as 'sickness' is developed under these conditions. Also airtight storage does not reduce the troubles which arise from sharp temperature gradients and surface condensation in climates where temperatures change rapidly. Amongst the claims made for airtight are that it prevents the entry of insects, rodents and ultimately kills any, which the grain may have originally contained, it prevents the uptake of moisture from the atmosphere during storage and it may reduce the rate of onset of fat acidity. The airtight storage deserves thorough trial in hot countries provided that grain can be harvested dry or where drying facilities exist. It is possible that the underground pit type of store which is commonly found in the country is in fact nearly airtight and the success of such stores should be the testimony to the efficacy of nearly airtight stores.

Nuclear control:

Because of a very low cost as compared to other chemical methods of control, efforts are being made by the Atomic Energy Commission of India to evolve a safe and cheap method of storage pests control by using nuclear energy. This is, however, conditional. If human health hazards are involved, this won't be feasible. Secondly, so long as mechanical handling is not adopted in general, it may not be possible to use nuclear energy for control purposes, because the whole operation has to be done at a speed which pre-requires the handling of grain mechanically.

Temperature in relation to insect infestation:

Studies show that heat moves through many of the agricultural commodities very slowly indeed. Vast amount of data have made it possible to calculate that diurnal temperature changes penetrate only about 6" into the bulk grain, while even natural temperature cycle from summer to winter is negligible at depths of 10'. The detection of deterioration through measurement of heat produced alone, however, is really a tricky problem. Essentially the insects are able in certain circumstances to induce hot spots by producing metabolic heat faster than it can escape from their immediate environments. Most grain pests are of tropical and sub-tropical origin. Their optimum temperatures lie between 28°C and 35°C and their maxima being usually 33°C and 40°C. Thus it is clear that grain should be kept at temperatures as far below the optima as possible. This is the difficulty in hot climates and it has been suggested as an alternative that attempts should be made to store grain at temperatures above the maxima quoted above. This theoretical possibility is almost certainly not practicable and would probably bring other serious troubles in its train. A number of other commodities are economically maintained

at low temperatures. Facilities of storage at controlled temperatures are being expanded every year. The optimum conditions necessary have already been worked out for most of the commodities.

Problems as an importing country: (Commercial aspects) -

Considerable portion of the bulk storage in India in respect of foodgrains is being built with imported grains. Quality assumes great significance as the exporter might be anxious to get rid of the surplus and the importer has to consider the problems of maintenance. Attitude of the importer is also considerably influenced by the standards of the public in the country. However, the fact that many countries have no import standards, has meant that goods rejected by the authorities for local consumption in exporting countries have been diverted elsewhere. This emphasises the need for a general raising of standards on the part of the principal importing countries.

It is clear that importing countries suffer losses and are put to a great deal of trouble in attempting to deal with infestation in imported foods. Much of this could be avoided if exporting countries control infestation before export. Today there can be no excuse, on technical ground, for the movement in international trade of infested commodities. Although proper facilities such as circulatory fumigation system or fumigation chambers are desirable, they are by no means essential, since fumigation of loose quantities is practicable under gas-proof sheets.

Thus what is needed is a greater demand specially by the importers of commodities that goods shall be un-infested on arrival. Competition between countries for markets for agricultural products has already caused certain exporting countries to lay down export quality standards and it is to be hoped that this tendency will spread. Pressure from importers is the most likely influence and this will not occur until they realise that infestation is not inevitable.

Research facilities:

Besides the Universities, Central Food Technological Research Institute, Mysore and Central Grain, Research & Training Centre, Hapur are imparting professional training covering all aspects of food technology. Hapur Institute is concerned with handling and inspection of grain and imparts training to the trainees sponsored by the State Governments and private bodies. Applied research is also undertaken to solve day-to-day problems regarding grain storage. Assessment of storability and working out of cheaper methods for pest control are some of its achievements.

Training, Future requirement and Research:

Training to personnel in engineering aspects of grain storage is being imparted in the country as well as technical personnel are being sent to obtain training in various disciplines of engineering of grain handling in Canada, U.S.A., U.K., etc.

There is a great need for intensifying research programmes in a scale which will minimise the lapse between the laboratory and field application. The techniques which have been developed recently in the

field of grain storage, need extended application and assessment, under field conditions in all the countries, where similar situations prevail.

Further research on the following lines is proposed:

(a) Comparative trials on the selection of the new types of structures developed in other countries for their suitability under Indian conditions. Structures like the Fossae in Malta, Plywood silo of Sierra Leone, Plastic-lined metal bin as has been used in U.S.A.,Ctosiphon structure of Kano, Khattis and Kothas of India, hemispherical grain silo of novel design of Jordan, underground semi-circular vaults of Argentina and modern mechanised silo-cum-elevators, should be studied for their suitability under the regional conditions.

(b) Technological aspects of fumigants and fumigations, with special reference to their application in silos, elevators, bins, warehouses, flat stores, farm barns, etc., need intensive studies in view of the high temperature conditions. The fumigants of high boiling point and low vapour pressure require critical assessment under the conditions of storage installations, structure and environmental temperatures. Application techniques and degassing and recirculatory equipment suitable for applications under the practical situation are to be developed. Enlarged facilities for technological training on fumigation, will have to be provided urgently.

(c) Ecology of the insect pests in bulks, with special reference to their habit, habitat, movement and distribution of life stages, with a view to devising simple methods for their control, based on the vulnerable features in the life history and behaviour, would be studied.

(d) Bulk-handling techniques and equipment should be developed and employed. Small-scale and large-scale handling techniques at every stage of processing, transport and storage are to be standardised. Drying techniques for bulk and moisture equilibrium in tall and large structures, will have to be developed.

(e) The criteria for predicting the soundness or storability of the grain and assessing the degree of infestation and microbial load which can be readily applied by grain storage establishments, are to be developed for different grains.

Keeping in view the expanded programme for storage in the coming years, bulk storage is a MUST under Indian conditions. The 'Third Plan' has allotted Rs.25 crores for the construction of additional warehouses by the Government for the storage of foodgrains and Rs.8 crores for warehousing programmes of other commodities. The provisions of storage capacity is a vital step in the implementation of price policy under the Plan and such further resources, as may be needed, are to be made available. Of course, the storage of grain in bulk involves special problems which have been studied fairly and intensively during the recent years. Much more is now known than was the case when it was decided to set up reserve stocks of grain in the country. For example, in the field of behaviour of insects, various species act in very different ways - some cannot be detected until they have caused damage ( e.g. Laemophloeus beetle in the midst of bulk), and others can at times cause alarm out of proportion to the damage which they do (e.g. Caterpillar of Ephestia at the migratory stage).

In the bulk stores now being planned, new techniques are constantly

under examination and experimentation. We have found under improvised loose grain storage that the quality of grain remains satisfactory and insect infestation remains limited to the periphery. Environmental moisture prevailing in the vacinity of the grain does not affect the internal core of the loose grain as happens in case of bagged grain. The problem of rat and mite infestation will become extinct with the modern rat-proof stores for loose grain in bulk. On the whole, it can be said that modern bulk storage is in the process of evolution in India and prospects of using new techniques are bright.

Table - I.

Local names of indigenous storage structures

| | Underground | Aboveground |
|---|---|---|
| (1) | 'Khattis ' - 15' dia. 16' ht. 15-25 tons bhoosa (husk) lined-mud plastered. | 'Petti' - boxlike mud bins |
| (2) | 'Banda' - 15' deep Convex Covering. | 'Bharolas' - 3' ht. mud bins. |
| (3) | 'Pev' - Underground godown. | 'Bukhari' - 8-10 tons chambers built against wall. |
| (4) | 'Targhars' - Cellers with lid-like doors. | Cement bins - 20-100 tons. |
| (5) | Khas-well-like, with stone. | Straw bins: 'Paras', 'Mudhas' 'Muras', 'Pattari' 'Pallas', 'Thekas' |
| (6) | 'Khais' - Mud or cement - Bhoosa (husk) lined - 20 to 40 tons. | Earthen receptacles - baked and unbaked. |
| (7) | | Metal receptacles. |

## BIBLIOGRAPHY


1. Pingale, S.V.
Bulk Storage of Foodgrains, Ann. Rev. Food Technol., 3, 1-14 (1962)

2. Pruthi, H.S. and Singh, M.
Pests of Stored grain and their control,
Ind. J.Agri. Sci., 18, 36-50 (1950)

3. Milner, M., Christensen, C.M. & Geddes, W.F.
Grain Storage Studies, V. Chemical and Microbial Studies on 'Sick' wheat, Cereal Chem., 24, 23-28 (1947)

4. Linko, P.
Water content and metabolism of wheat during short storage and germination,
Ann. Acad. Scient. Fennicae A.II. 98, 1-69 (1960)

5. Christensen, C.M. and Gorden, D.R.
The mold flora of stored wheat and corn and its relation to heating of moist grain, Cereal Chem., 25, 40-51 (1948)

6. Hyde, M.B. & Oxley, T.A.
Experiments on the airtight storage of damp grain,
I. Introduction, effect on the grain and the intergranular atmosphere, Ann. Appl. Biol. 48, 687-710 (1960)

7. Christenson, C.M.,
Deterioration of stored grain by Fungi.
Botanical review 23(2) - 108-134 (1957)

8. Turtle, E.E.
Pest problems -
Manuf. 35(8) - 324-326 (1960)

9. Ministry of Food & Agriculture (Department of Food), Government of India, - Report of the Foodgrains Enquiry Committee - (1957).

10. 'Third Five-Year Plan' - Government of India (1961).

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UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

**SUMMARY**

Agenda Item: D.4.3

India

# PROBLEM OF BULK STORAGE AND THE PROSPECTS OF NEW TECHNIQUES IN THIS FIELD : MINISTRY OF FOOD AND AGRICULTURE

By S.V. PINGALE
and N.S. AGRAWAL

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UNITED NATIONS CONFERENCE
ON
THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF LESS DEVELOPED AREAS

Agenda Item: D-4: Problem of Bulk Storage and the prospects of new techniques in this field (Ministry of Food & Agriculture)

by

S.V. Pingale[1], and N.S. Agrawal[2]

SUMMARY

Considerations which led to the development of conventional methods of bulk storage prevalent in India and their limitations to meet the present-day demand have been discussed.

Indian situation in regard to the various aspects such as types of resources available for storage, storage facilities and engineering knowledge, transport problems, storability under varying conditions of the country, marketing facilities with special reference to grading on national basis has been reviewed and suggestions made. Possibilities of using new techniques in the field such as mechanical handling of grain, airtight storage, cold storage and nuclear radiation to control pest infestation have been examined in detail.

The problems of bulk storage are varied and many, but it has been observed that bulk storage is essential under Indian conditions. In the bulk stores now being planned, new techniques are constantly under examination and experimentation. Modern bulk storage can be said to be in the process of evolution in India and prospects of using new techniques are considerable.

1,2 - Department of Food, Government of India, New Delhi.

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CONFÉRENCE DES NATIONS UNIES
SUR L'APPLICATION DE LA SCIENCE ET DE LA TECHNIQUE
DANS L'INTÉRÊT DES RÉGIONS PEU DÉVELOPPÉES

Point de l'ordre du jour : D.14 France

# CONSTRUCTIONS TRES ECONOMIQUES

Par G. BLACHERE,
Directeur du C. S. T. B.

Les mémoires rédigés à l'intention de la Conférence des Nations Unies sur l'application de la science et de la technique dans l'intérêt des régions peu développées sont des documents de travail. Ils sont publiés tels qu'ils ont été présentés et les assertions et opinions qu'ils contiennent sont celles de leurs auteurs.

## NOTES

1. Les mémoires choisis pour être présentés en séance générale pourront être obtenus à la Conférence dans les langues officielles suivantes des Nations Unies: anglais, espagnol, français et russe.

2. Les mémoires choisis pour être présentés en séance spéciale pourront être obtenus à la Conférence dans l'une seulement de ces langues officielles.

3. Les résumés qui ont été rédigés pour tous les mémoires par les auteurs de ceux-ci pourront être obtenus à la Conférence dans les langues officielles suivantes des Nations Unies: anglais, espagnol, français et russe.

4. Préalablement à la Conférence, les mémoires et les résumés ne feront pas l'objet d'une distribution générale mais d'un tirage restreint destiné aux délégations des gouvernements et autres participants officiels. La publication et la distribution générale des actes de la Conférence s'effectueront conformément aux règles et pratiques agréées par le Comité des publications des Nations Unies.

# CONSTRUCTIONS TRES ECONOMIQUES

Parmi les populations qu'il faut loger, il s'en trouve une bonne partie qui rentre dans l'une des deux catégories suivantes :

- agriculteurs propriétaires de toutes petites parcelles ou fermiers dans des conditions de fermage plus ou moins dures, qui tirent du sol leur subsistance, mais ont un revenu en espèces pratiquement nul ;
- populations suburbaines, sans emploi régulier, qui arrivent tout au plus à subvenir à leur nourriture, dont le revenu disponible, une fois qu'ils se sont nourris, est lui aussi quasiment nul.

Pour la commodité du langage, nous appellerons ceux qui appartiennent à ces deux groupes de populations des "économiquement très faibles".

Au-dessus d'eux, se trouve un nombre considérable également de familles dont le chef est doté d'un emploi régulier, mais rémunéré au niveau du salaire minimum. C'est le cas des petits employés, des petits fonctionnaires, des ouvriers permanents. Le revenu de cette catégorie de la population est de l'ordre de 30 à 40 dollars par mois. Nous les baptiserons dans la suite "économiquement faibles".

Les économiquement très faibles, n'ayant pas de revenu disponible, sont incapables de payer un loyer. De toute façon, pour ceux d'entre eux qui sont agriculteurs, leur vocation à devenir propriétaires de leur habitation est assez évidente. La formule de la location ne se présente donc pas sous un jour favorable pour cette catégorie.
Le problème pourrait paraître, dès lors, désespéré parce que nous concluons que les plus pauvres doivent devenir propriétaires, ce qui est plus difficile que d'être locataires.

Mais une circonstance heureuse vient apporter la solution : ces populations économiquement très faibles ont le plus souvent de la main d'oeuvre disponible, car la faiblesse du revenu est liée à un sous-emploi ou à une absence d'emploi. Assez souvent aussi, ces populations ont l'habitude de réaliser elles-mêmes leur habitat dans des conditions souvent très mauvaises, il est vrai.
Il n'en reste pas moins que l'on se trouve avoir une disponibilité de main d'oeuvre et une habitude de créer son logement par ses propres moyens, qui sont favorables à ce qu'on appelle en français le système Castor et en anglais le système self-help, qui consistent à favoriser la construction,par les intéressés eux-mêmes, d'une habitation améliorée grâce à des conseils, à des concours et à une aide.

Des considérations plus détaillées sur le système Castor sont données dans notre mémoire "Constructions par le système Castor" (Groupe G).

Le coût de l'aide doit être limité. L'expérience prouve qu'une aide de 500 dollars est suffisante. A cette dépense il convient d'ajouter le coût du moniteur et de l'organisation générale.

Au total, c'est un système qui a maintenant des références et des dizaines de milliers d'habitations ont été réalisées ainsi. Les références que nous connaissons le mieux sont celles de Tunisie et d'Algérie.

Après les économiquement très faibles, considérons le cas des économiquement faibles. Leurs exigences à l'égard de leur logement sont nettement plus importantes que celles des économiquement très faibles. Ils sont incorporés dans la vie sociale et économique moderne, et ils peuvent fixer leurs exigences par référence aux logements de la population plus riche. Pour eux donc, il va falloir concevoir des constructions dont le coût correspond à 2 ans I/2 de salaire, selon la grande loi générale, et qui coûteront environ I000 à I200 dollars. Il est vraisemblable que ces constructions devront bénéficier de facilités financières pour diminuer la charge du loyer ou des annuités (d'autant plus que souvent, dans les pays en cause, le loyer des logements est très élevé car les capitaux sont rares). Il est donc normal de penser d'abord à la location avant l'accession à la propriété. Il faut alors considérer que le logement des économiquement faibles sera essentiellement composé de constructions dont le coût sera de l'ordre de I000 à I200 dollars.

Pour la réalisation de ces constructions, il conviendra d'avoir recours à des organismes constructeurs bénéficiant de l'aide de l'Etat et analogues aux sociétés d'H.L.M. de France ou au crédit hypothècaire. Cette formule a été utilisée très largement dans de nombreux pays méditerranéens, dans plusieurs pays d'Amérique Latine et certainement dans beaucoup d'autres endroits encore.

L'accession à la propriété a été assez souvent pratiquée, mais au prix de facilités financières considérables.

Venons en à quelques considérations techniques sur les deux types de construction : constructions Castor et constructions pour économiquement faibles. Nous nous placerons dans l'hypothèse du climat tropical chaud et sec ou du climat tempéré chaud.

Le programme d'une habitation, quelqu'économique qu'elle soit, c'est toujours une liste d'exigences humaines (voir notre mémoire sur la qualité des construction). Il convient de ne pas transiger sur celles qui sont impératives et de fixer à un niveau compatible avec les conditions économiques celles qui sont contingentes.

Ce qui suit n'a plus trait aux exigences humaines, mais plutôt aux règles de qualité et aux moyens pratiques.

Les plans de ces habitations, bien qu'ils varient suivant le climat et les coutumes ont entre eux beaucoup de ressemblances.

Pour les Castors, il ne peut s'agir que de constructions à rez-de-chaussée, de petite superficie (I2 à 20 m2).

Dans les logements pour l'économiquement faible, on rencontre des logements à rez-de-chaussée sur patio, de type méditerranéen, des logements individuels à deux niveaux. La juxtaposition des constructions en paquets ou en bandes est de règle pour économiser des murs, des clôtures et du terrain.

La qualité essentielle des murs, outre de porter la toiture et d' être durables, est d'avoir une isolation et une masse thermique suffisante. Les procédés traditionnels d'utilisation de blocs de terre peuvent être améliorés par les techniques de la terre stabilisée. Ces procédés se recommandent là où les matériaux pierreux sont rares. Ailleurs, la maçonnerie de pierre sèche ou maçonnerie à la terre doit cèder la place aux parpaings de béton et parfois pour les habitations construites à l'entreprise, aux grands éléments de béton coulés sur chantier. On peut et l'on doit exiger des ccefficients d'isolation thermique qui peuvent être aussi bons que 1,2 pour des panneaux préfabriqués et ne

pas excéder I,4 pour des parpaings à nombreux trous. L'emploi du plâtre est possible dans certaines régions.

La toiture pose davantage de problèmes que les murs, car bien souvent on manque à la fois de bois de charpente et de matériaux de couverture. Il convient de porter attention non seulement à son étanchéité mais aussi à ses qualités thermiques parce que c'est par la toiture que, dans les constructions à rez-de-chaussées, entre le plus de rayonnement solaire, et à sa stabilité en cas de séisme.

Dans les opérations Castor, il conviendra fréquemment qu'une partie importante de l'aide en nature soit consacrée à la fourniture de matériaux de toiture.

Il faut penser à la réalisation du pare-soleil de toiture et il faut tendre à obtenir de l'ensemble de la toiture un coefficient K voisin de 1.

La réalisation de pare-soleil de toiture est relativement facile sur des couvertures en terrasse si l'on dispose de roseaux ou de bambous. L'on peut aussi avoir une toiture à forte pente séparée du plafond des chambres.

Les chambres sont en sommes construites sous un parasol - parapluie.

Les baies ne posent pas de problème particulier dans les constructions loca-tives. Il faut prévoir leur occultation par des volets pleins, si possible projetables.

Dans les constructions Castor, on sera amené souvent à ne pas prévoir de fenêtres vitrées et à fermer les baies par de simples volets pleins. Cela peut poser des problèmes de ventilation ou d'éclairage dans des pays très chauds où les volets sont normalement fermés le jour.

La ventilation doit être étudiée. La ventilation transversale est indispensable dans des climats moyennement chauds et chauds. Il faut donc avoir des ouvertures juste au ras du plafond. Un conduit de fumée est indispensable et servira au chauffage sinon à la cuisine.

Les sols iront de la terre battue, dans le cas des Castors, à la dalle de béton et au carrelage pour les locatifs. Le pavage en plaques de terre stabilitée est possible.

Ce ne sont là que des rappels très succincts, mais l'expérience prouve que pour qui connait la physique du bâtiment, il est possible de faire dans l'une ou l'autre catégorie d'habitations des constructions dont le niveau de confort est intéressant en considération surtout de la dépense.

Une constante dans les choix qui sont à faire sera le souci de durabilité (qui fera préférer le bloc de béton à la terre stabilisée), le souci d'un entretien peu important et facile, le souci de l'hygiène et de la propreté.

Enfin, ces constructions sont nécessairement d'un aspect extérieur très modeste et leur agglomération peut être, si l'on n'y prend garde, d'une grande monotonie. C'est par le jeu des volumes des constructions entre eux, appuyé sur le relief, et tenant compte de quelques principes simples comme celui de ne pas exagérer la voirie, de rechercher l'anecdote, que l'on peut donner à l'agglomération l'âme vivante d'un village.


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**SUMMARY**

Agenda Item: D.14

France

# LOW-COST HOUSING

By G. BLACHERE,
Director of the C.S.T.B.

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# LOW-COST HOUSING (POOR FORMER HOUSING IN NORTH AFRICA)

By
G. BLACHERE, DIRECTOR OF THE C.S.T.B.

In a very general sense there are two population categories whose income level does not permit them to live in houses of a standard enjoyed by the normal income-level population group.

1. These are families whose head has no fixed employment, of the type who live at present in improvised dwellings at the edges of the towns, agricultural workers and very small landowners who live in huts or shacks grouped in villages or otherwise.

   For these families, whose cash income is virtually nil, or in any case lower than the essential minimum, the best solution is the Castor or self-help system.

2. Families which have a very small income equal to or barely above the essential minimum. These are families whose head has a permanent job as a workman or minor clerk or official.

   For these families, the answer lies in very low-cost housing. They normally pay rent.

   The Castor type of building, or a very low-cost renting scheme, is a temporary solution which can be employed as long as the average income of a population group remains very low. A temporary solution of this kind is justified by the quality of the results which can be obtained.

   In planning very low-cost housing, the whole range of human requirements must be taken into consideration and assessed in regard to which of these factors an economy can be effected.

   The methods employable for the different parts of the building are reviewed. Attention is drawn to the classic dangers which should be avoided, and mention is made of town planning considerations which are particular to this type of housing estate.

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